

Complete, fold and seal
(see note 2 below)

SURNAME:

HUGHES

Examination Answer Books

12 Pages

Instructions to Candidates

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

1	Student Number	170844211
2	Title of Examination Paper	Dynamics Control & Instrumentation
3	Module Code	MLX01405
4	Date and Time of Examination	15/5/19 1:30
5	Examination Venue	Ward 2 Gower College.
6	Seat Number	
7	Number of Answer Books handed in	

[illegible]

40% ✓

Q1. S = Displacement
 U = Initial velocity
 V = Final velocity
 A = Acceleration
 T = Time.

	H	Horizontal	Vertical
S			
U		0	
V		0	
A			
T			80 m/s

Q2. A. $S = 24t^2 + 18t - 17$

B. $S = 14t^2 + 5t + 25$

a.)

$$V_A = 48t + 18$$

$$= 48$$

$$V_B = 28t + 5$$

$$= 28$$

$$V_A = V_B \times 3$$

$$48t + 18 = 28t + 5 \quad 84t + 15$$

$$48t - 28t =$$

$$18 - 15 = 84t - 48t$$

$$3 = 36t$$

$$\frac{36}{3} = 12$$

X

~~Velocity of particle A~~

$$\text{Time of particle A} = 12s$$

b) Particle A when $t = 0s$

$$S = 24t^2 + 18t - 17$$

$$= 0 + 0 - 17$$

$$\text{Distance} = \underline{0m}$$

Particle A when $t = 4$

$$S = 24t^2 + 18t - 17$$

$$= 384 + 72$$

$$\text{Distance} = 456m$$

Particle B when $t = 0$

$$S = 14t^2 + 5t + 25$$

$$= 0 + 0$$

$$\text{Distance} = 0\text{m.}$$

Particle B when $t = 4$.

$$S = 14t^2 + 5t + 25$$
$$= 224 + 20$$

$$\text{Distance} = 248\text{m}$$

C) A $S = 24t^2 + 18t - 17$

$$VA = 48t + 18$$
$$= 48.$$

$$48 \times 3 = 144$$

$$\text{Acceleration} = 144\text{ m/s.}$$

+

Q4.

a.)

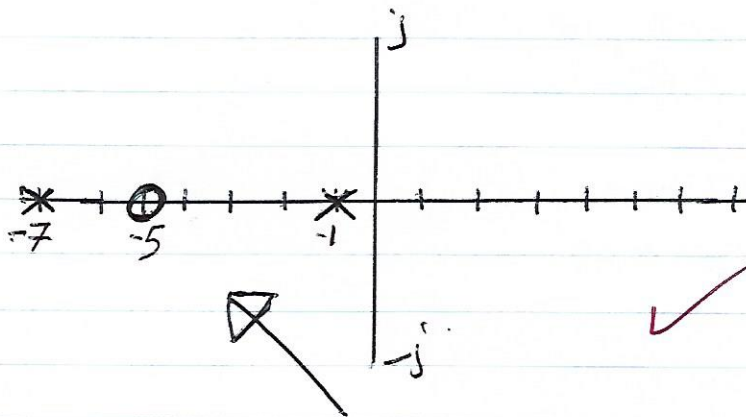
$$G_s = \frac{(s+5)}{s^2+8s+7}$$

1x7.

$$\frac{(s+5)}{s(s+1)(s+7)}$$

$$\text{Zero} = -5$$

$$\text{Poles} = -1, -7$$



Both poles are on the left therefore the system is stable.

b) D.C f = 0

Therefore $s = 0$

$$G_s = \frac{(s+5)}{s^2+8s+7}$$

$$= \frac{(0+5)}{0^2+8(0)+7}$$

$$= \frac{5}{7}$$

D.C response = 0.714.

c.)

$$G_s = \frac{(s+5)}{s^2+8s+7}$$

$$\frac{A}{1} + \frac{B}{(s+5)} + \frac{C}{s^2+8s+7}.$$

✓

Q 5.

a) $2s^5 + 3s^4 + 2s^3 + s^2 - s + 4$

$$\begin{array}{rcl}
 s^5 & | & 2 \quad 2 \quad -1 \quad 0 \quad \checkmark \\
 + s^4 & | & 3 \quad 1 \quad 4 \quad 0 \quad \checkmark \\
 + s^3 & | & 1.3 \cdot 3 \cdot 6 \quad 0 \quad \checkmark \\
 + s^2 & | & \underline{7.3} \quad 4 \cdot 0 \quad \checkmark \\
 - s^1 & | & -4.3 \quad 0 \quad \checkmark \\
 + s^0 & | & 4. \quad \checkmark
 \end{array}$$

$$s^3_i = \left| \begin{array}{c} 2 \times 1 \\ - \frac{3 \times 2}{3} \end{array} \right| = - \left| \frac{-4}{3} \right| = 1.3$$

$$s^3_{ii} = \left| \begin{array}{c} 2 \times 4 \\ - \frac{3 \times -1}{3} \end{array} \right| = \left| \frac{11}{3} \right| = -3.6$$

$$s^2_i = \left| \begin{array}{c} 3 \times -3.6 \\ - \frac{1.3 \times 1}{1.3} \end{array} \right| = - \left| \frac{-9.5}{1.3} \right| = \underline{7.3}$$

$$s^2_{ii} = \left| \begin{array}{c} 3 \times 0 \\ - \frac{1.3 \times 4}{1.3} \end{array} \right| = - \left| \frac{-5.2}{1.3} \right| = 4$$

$$s^1_i = \left| \begin{array}{c} 1.3 \times 4 \\ - \frac{7.3 \times -3.6}{7.3} \end{array} \right| = \left| \frac{31.48}{7.3} \right| = -4.3$$

$$s^0_i = \left| \begin{array}{c} 7.3 \times 0 \\ - \frac{-4.3 \times 4}{-4.3} \end{array} \right| = - \left| \frac{17.2}{-4.3} \right| = 4$$

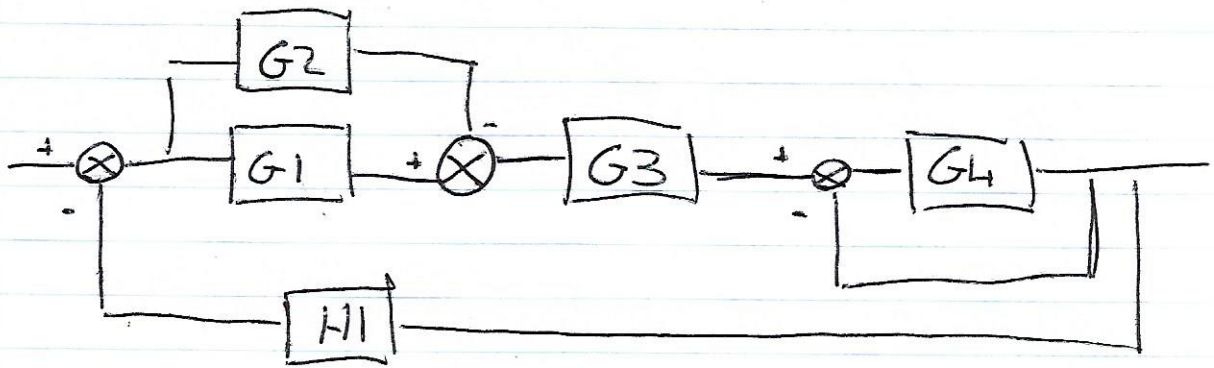
→

There are 2 changes of sign in my grid, therefore there are 2 poles on the right side of the pole zero diagram meaning the system is unstable. ✓

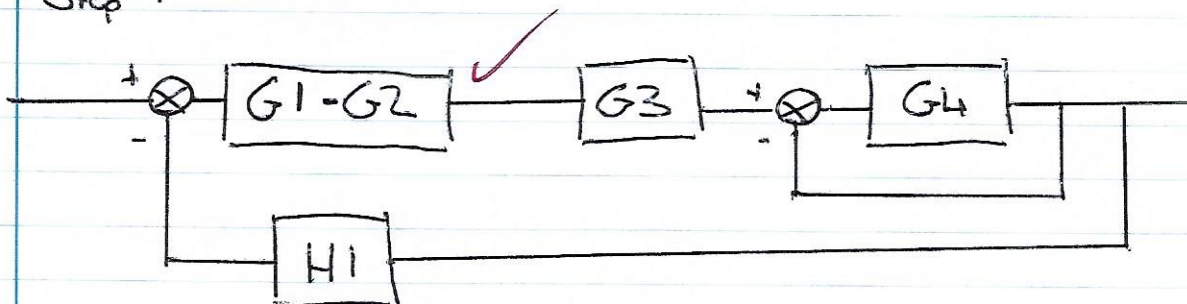
(9.1)
✓

Q6.

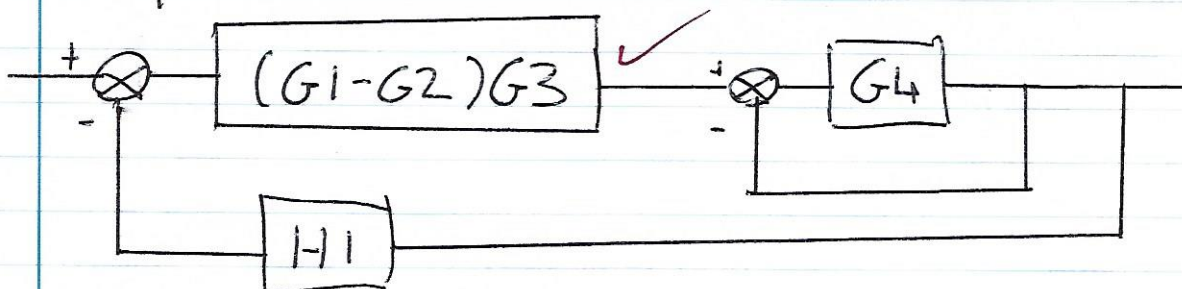
a.)



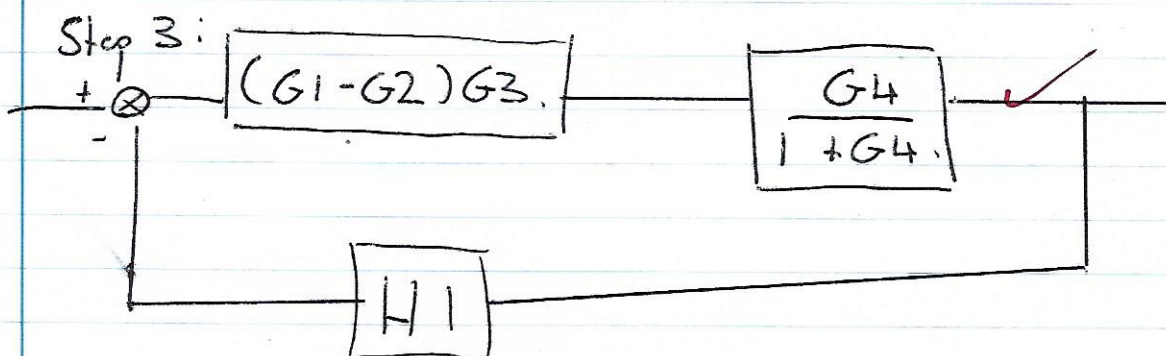
Step 1:



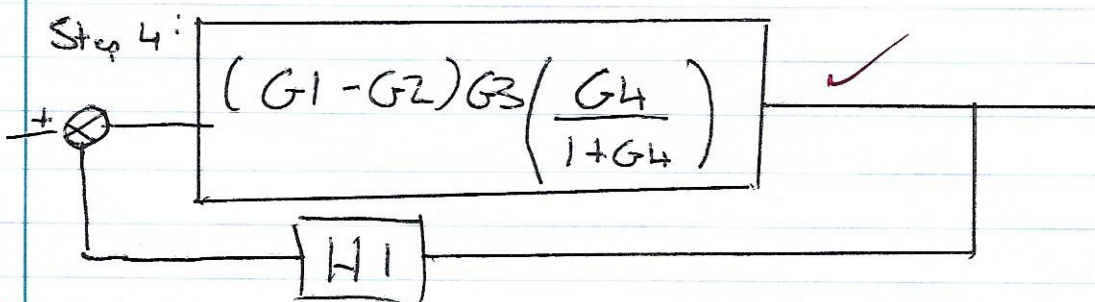
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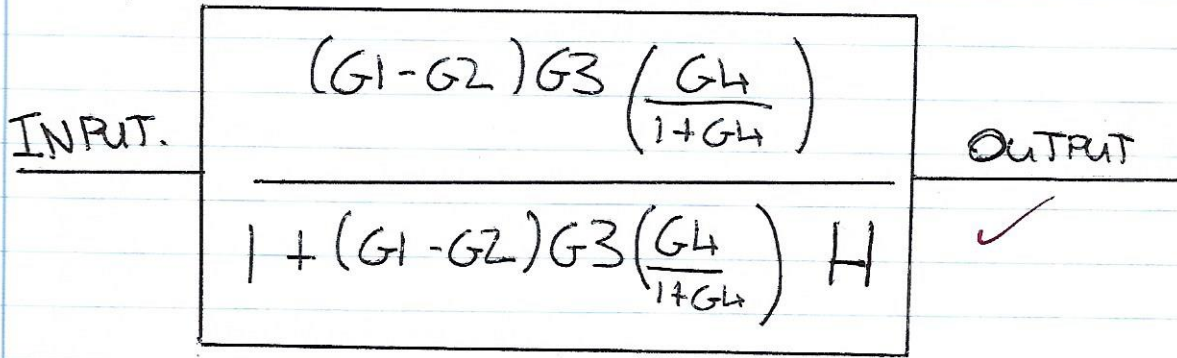
Step 3:



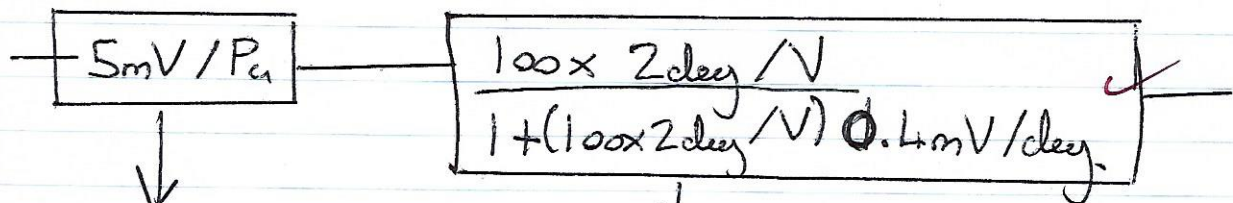
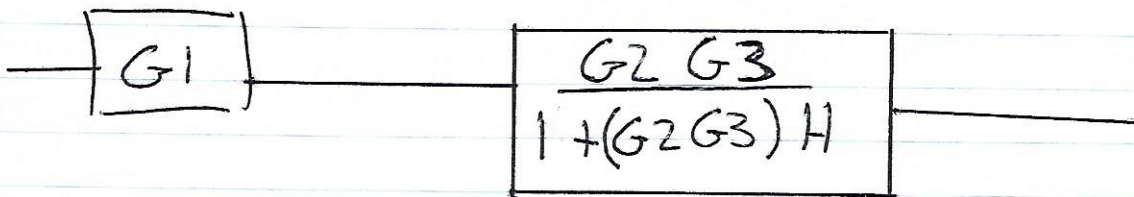
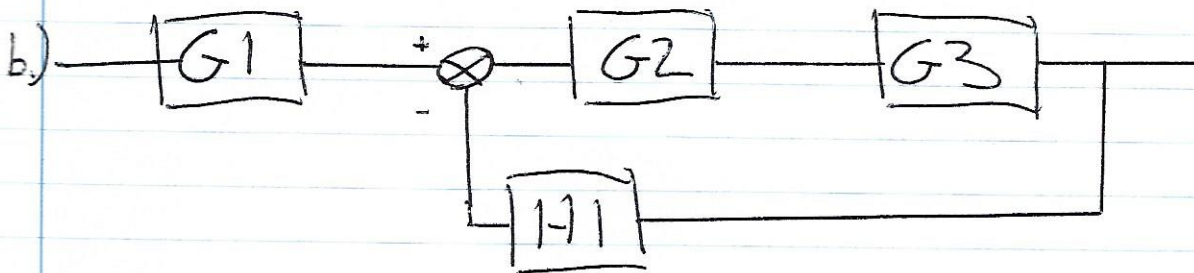
Step 4:



Step 5:



4. ✓



2. ✓

$$0.005 \text{ V/Pa}$$

$$\downarrow$$

$$5 \text{ V/1000}$$

$$\frac{200 \text{ dec/V}}{1 + (200 \text{ dec/V}) \cdot 0.0004 \text{ V/dec}}$$